Engineered Wood Products
Prospects for Australia

Prepared for the Forest and Wood Products Research and Development Corporation

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foreword

The standing volume of softwood in Australia has largely determined the quantity of engineered wood products produced. Currently, Australia’s engineered wood product manufacturing industry is operating close to full input capacity. However, as the increase in domestic softwood supplies is expected to plateau soon, capacity constraints are unlikely to be a significant issue in the near term. Over the next forty years, availability of softwood is projected to grow at only around 0.5 per cent a year.

In the light of expectations of moderate supply and capacity increases, the challenge for Australia’s engineered wood product manufacturers is to remain competitive in world markets that are characterised by declining real prices.

This report presents a brief analysis of the Australian engineered wood products industry, based on current estimates of softwood availability, and international market dynamics. A brief case study of China’s engineered wood products industry and market prospects is also presented.

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August 2004
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# contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineered wood products</td>
<td>1</td>
</tr>
<tr>
<td>Softwood log availability</td>
<td>3</td>
</tr>
<tr>
<td>Production of engineered wood products</td>
<td>4</td>
</tr>
<tr>
<td>Markets for Australia’s engineered wood</td>
<td>6</td>
</tr>
<tr>
<td>products</td>
<td></td>
</tr>
<tr>
<td>China’s market continues to grow</td>
<td>9</td>
</tr>
<tr>
<td>Conclusion</td>
<td>10</td>
</tr>
<tr>
<td>References</td>
<td>11</td>
</tr>
</tbody>
</table>
boxes
1  Engineered wood products  2
2  Performance based building codes  8

figures
A  Australia’s softwood log availability  3
B  Australia’s wood based panel production  5
C  World price indexes  6
D  Australia’s EWP exports  6
E  EWP consumption trends for selected countries  7
F  World EWP export unit values  8

map
1  Australia’s wood processing locations, 2002  4

tables
1  Australian engineered wood products, 2002-03  5
2  Apparent consumption of EWPs in major markets, 2002  7
engineered wood products

Engineered wood products (EWPs) are manufactured by the adhesion of wood fibres, flakes or veneer material to a requisite standard and dimension (box 1). The primary materials used to produce these products are of relatively low value and are sourced from all stages of timber production, including logs and mill byproducts such as sawn wood offcuts, woodchips and sawdust.

Compared with solid lumber and steel, engineered wood products can offer a lower cost solution to the increasing demand for greater performance requirements of the building industry. The dimensional limits of solid lumber are restricted and the supply of large diameter lumber is declining. Within the existing dimensional limits of lumber, its applications are constrained by physical properties such as strength and stiffness.

The bulk of EWP production in Australia is predominantly wood based panel products such as plywood, particleboard and medium density fibreboard (MDF). However, there is a relatively small but rapidly growing market for load bearing EWP products, including laminated veneer lumber (LVL), glued laminated timber (glulam) and I-beams.

Consumption of EWPs globally has been growing with the increased consumer awareness of their attributes. In a technical sense, EWPs generally have greater strength, uniformity and quality than sawn lumber and can be used over a wider range of applications. They can also provide a lightweight alternative to steel.
Box 1: Engineered wood products

Engineered wood products are manufactured by gluing together ligneous softwood material to a known standard. The raw ligneous (containing wood fibres) material is sourced from all stages of timber production including thinnings, logs and mill byproducts such as dimensioned wood offcuts, woodchips and sawdust. Softwood tree species are primarily used because of their more favorable fibre and density properties compared with hardwood species. However, hardwood species are often the source of ligneous material for hardboard manufacture and veneers used in the production of plywoods.

Primary engineered wood products are made using a wide variety of technologies. Logs and wood offcuts can be pulverised, chipped or flaked and reconstituted using adhesives into sheets or wood based panels. Alternatively, wood offcuts can be joined end to end by finger jointing and gluing to form longer lengths of dimensioned lumber. Wood based panel products include medium density fibreboard (MDF), particleboard, hardboard, oriented strand board (OSB) and plywood. Load bearing products include laminated veneer lumber (LVL), glued laminated timber (glulam) and I-beams.

Medium density fibreboard is a fibreboard using reconstituted fine wood fibres. The fibres are bonded using adhesives and then heat pressed. MDF is well suited to further machining (such as routing) and a wide range of internal applications such as furniture manufacturing.

Particleboard manufacture is similar to that of MDF, but uses predominantly larger chips. It is suitable for interior use only and remains the world’s dominant wood based panel. Particleboard is used extensively in structural applications (floors, stairs) and in cabinet making.

Hardboard is manufactured using hardwood ligneous fibres, without additional adhesives. Under sufficient heat and pressure, lignin will flow and act as a thermosetting adhesive. In Australia hardboard is commonly recognised as Masonite™ or Weathertex™.

Plywood is made of thin sheets of veneer peeled from a log and arranged in layers to form a panel. Alternate layers are oriented at 90 degrees to enhance the strength of the panel. Glues and hot pressing are used to adhere and bond the veneer layers into a panel product. Plywood is used widely in both construction and furniture manufacturing industries.

Oriented strand board manufacture also requires adhesives, heat and pressure but consists of compressed ligneous strands arranged in layers oriented at right angles to one another, similar to plywood. OSB is widely used in commercial and residential construction and can be the vertical, load bearing component of I-beams.

Laminated veneer lumber is created by gluing layers of graded wood veneers into blocks with the grain of each layer of veneer running in the same direction. These blocks are then sawn lengthways to produce dimensioned lumber. The greater dimensional and load bearing characteristics of LVLs compared with solid lumber make them ideal for construction and spanning.

I-beams consist of top and bottom flanges united with webs. The flanges are generally made of solid sawn lumber or LVL and the webs are made from plywood or OSB. I-beams provide a strong, economical and lightweight load bearing solution in residential and light commercial applications.

Glued laminated timber (glulam) consists of solid wood laminations bonded together with strong, waterproof adhesives. Glulam provides load bearing solutions in both commercial and residential construction, particularly where requirements are for spanning of long distances or curved beams and trusses.

Adapted from: APA – The Engineered Wood Association (2004); Forest Products Laboratory (1999).
softwood log availability

The availability of softwood (coniferous) log supplies — that is, the standing volume of timber that is potentially harvestable — has largely determined the quantity of EWPs produced in Australia. Although the motivation for the establishment of softwood plantations is sawn lumber production, milling generates a proportion of residue in the form of sawdust and offcuts that are used to manufacture EWPs. Coniferous tree species are primarily used in the production of EWPs in Australia because they are a relatively cheap source of homogeneous and easy to process wood fibres. Fibres derived from native hardwood species are generally too heterogeneous for wood panel production. As an input resource into EWP plants, hardwood logs are generally reserved for plywood manufacture, although there are two hardboard plants using hardwood fibres (some of which are plywood manufacturing byproducts).

The availability of plantation logs today is the outcome of previous establishment policies. In the 1960s the Australian Government became concerned with the increasing volumes of softwood imports and balance of payment issues more generally (Ferguson, Spencer, Wood and Gerrand 2002). This began a ten year campaign for self sufficiency during which the Commonwealth provided low interest loans to state governments to establish state owned softwood plantations between 1967 and 1977 (AUSTEHC 2000).

A change in Commonwealth forest policy in 1977 led to the cessation of low interest loans to the states. With the removal of this incentive, softwood plantings declined and, increasingly, private investment in hardwood plantations predominated. It has been projected that softwood availability in Australia will increase only marginally over the next forty years (Ferguson, Fox, Baker, Stackpole and Wild 2002) (figure A). Between 1959-60 and 2002-03, softwood log extraction grew at around 5 per cent a year. In contrast, softwood log availability is projected to grow at around 0.5 per cent a year over the next forty years. Since the policy change, three-quarters of all softwood plantings undertaken have been to restock original softwood plantations (NFI 2003, 2004).
production of engineered wood products

The proliferation of softwood in the early 1990s provided industry with an incentive to increase the capacity to use mill byproducts. A potentially large supply of such byproducts was anticipated and it was around this time that many of the MDF and other wood based panel production facilities were established. The locations of plants manufacturing EWPs relative to Australia’s forest plantations are shown in map 1.

The total production of wood based panels has been growing at an average annual rate of 5 per cent since the early 1990s (figure B). In 2002-03, Australia produced around 2 million cubic metres of wood based panels (table 1).
Particleboard manufacture dominates domestic EWP production. It accounted for around 50 per cent (1 million cubic metres) of total wood based panel production in 2002-03. However, growth in particleboard production has averaged only 3 per cent a year since 1992-93. MDF production has been growing at an average annual rate of 8 per cent and now accounts for 39 per cent of wood based panel production. Plywood accounts for around 10 per cent of Australian wood based panel production and has been increasing at an average rate of 5 per cent a year since 1992-93. Production in 2002-03 was 219 000 cubic metres.

In 2002, wood product processing plants in Australia were operating, on average, at around 82 per cent of log input capacity, with some EWP plants operating at full capacity. If softwood availability were to continue to grow at the historical rate of around 5 per cent a year, then current industry capacity could have limited EWP output growth within a few years. However, given the slower projected growth in domestic softwood log availability of around 0.5 per cent a year, it is unlikely that current industry capacity would constrain expansion of EWP production. Expansion of the EWP industry is therefore dependent on the profitability of sourcing other substitute fibre inputs such as imported softwood logs, plantation hardwood or other nonwood fibres.

![Graph showing Australia’s wood based panel production from 1992-93 to 2002-03.](image)

**Table: Australian engineered wood products, 2002-03**

<table>
<thead>
<tr>
<th></th>
<th>Particleboard</th>
<th>MDF</th>
<th>Plywood</th>
<th>Total</th>
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<tr>
<td>Production</td>
<td>1 025</td>
<td>786</td>
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<td>2030</td>
</tr>
<tr>
<td>Imports</td>
<td>85</td>
<td>92</td>
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<td>378</td>
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<td>Exports</td>
<td>7</td>
<td>405</td>
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<tr>
<td>Consumption</td>
<td>1 103</td>
<td>473</td>
<td>382</td>
<td>1 923</td>
</tr>
</tbody>
</table>

*Sources: ABS and ABARE.*
markets for Australia’s engineered wood products

Apparent consumption of wood based panels in Australia has been increasing at an average rate of 5 per cent a year since 1992-93. Apparent consumption is defined as production plus imports less exports. In 2002-03 apparent consumption of particleboard, MDF and plywood was almost 2 million cubic metres (table 1).

Consumption of EWPs is derived largely from demand from the building, cabinet and furniture industries. As such, it is affected by the growth in those markets and the relative prices of substitute building materials such as solid timber and steel. Economic growth in Australia is expected to remain robust relative to that of most other OECD economies. Over the medium term, the Australian economy is assumed to grow by around 3.5 per cent a year. An expected easing of housing activity (Penm 2004) could lead to reduced domestic consumption of wood based panels used in the construction industry. However, the recent rise in steel prices (figure C) may lead to increased demand for load bearing EWPs such as glulam and I-beams.

Australia’s EWP industry is becoming increasingly export oriented, with exports rising elevenfold from 43 000 cubic metres in 1989-90 to 485 000 cubic metres in 2002-03, largely due to the growth in MDF exports (figure D). Australia’s MDF exports have quadrupled since 1992-93 and now stand at around 405 000 cubic metres. Since 2000-01, more of the MDF that has been manufactured in Australia has been exported than consumed domestically. The main destinations for Australia’s...
MDF exports are China (35 per cent), the Republic of Korea (26 per cent), Japan (12 per cent) and Chinese Taipei (8 per cent). Most other EWP exports have trended upwards over the same period.

Trends in apparent consumption in key world EWP markets are shown in figure E. The world’s largest consumers of EWPs in 2002 included the United States (56 million cubic metres), China (28 million cubic metres), Germany (12 million cubic metres) and Japan (11 million cubic metres) (table 2). China, Japan and the Republic of Korea are key markets for Australian exporters. One of the many factors driving the demand for EWPs is the worldwide adoption of performance based building codes (see box 2).

Average annual growth rates of apparent MDF consumption in Australia’s key export markets have been strong since 1995 — China (22 per cent), the Republic of Korea (16 per cent) and Japan (10 per cent). Strong export growth from Australia has been observed in all

### Apparent consumption of EWPs in major markets, 2002

<table>
<thead>
<tr>
<th></th>
<th>Plywood</th>
<th>Particleboard</th>
<th>MDF</th>
<th>Other</th>
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</thead>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0.3</td>
<td>0.9</td>
<td>0.5</td>
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<tr>
<td><strong>North America</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>18.9</td>
<td>27.2</td>
<td>5.8</td>
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</tr>
<tr>
<td>Canada</td>
<td>1.9</td>
<td>3.2</td>
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<td>0.2</td>
</tr>
<tr>
<td><strong>North Asia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>11.7</td>
<td>4.6</td>
<td>4.4</td>
<td>6.9</td>
</tr>
<tr>
<td>Japan</td>
<td>7.8</td>
<td>1.6</td>
<td>1.1</td>
<td>0.7</td>
</tr>
<tr>
<td>Korea, Rep. of</td>
<td>2.2</td>
<td>1.6</td>
<td>1.9</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>European Union</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>1.1</td>
<td>8.5</td>
<td>1.7</td>
<td>0.7</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1.1</td>
<td>3.4</td>
<td>1.1</td>
<td>0.5</td>
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<tr>
<td>Italy</td>
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<td>3.4</td>
<td>0.5</td>
<td>1.6</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0.1</td>
<td>0.1</td>
<td>4.5</td>
</tr>
<tr>
<td>India</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
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<tr>
<td><strong>South America</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Brazil</td>
<td>1.5</td>
<td>1.8</td>
<td>0.4</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Russian Federation</strong></td>
<td></td>
<td></td>
<td>0.7</td>
<td>0.5</td>
</tr>
</tbody>
</table>

*Source: FAOSTAT.*
of these Asian markets, but the 96 per cent average annual growth rate in Australia’s MDF exports to China since 1997-98 has been remarkable.

World export markets have been growing more rapidly than Australia’s domestic market. The volume of EWPs traded on world markets grew on average by 7 per cent a year between 1995 (42 million cubic metres) and 2002 (66 million cubic metres). It is expected that growth in world trade will continue, especially from the Asian economies. These economies are expecting higher economic growth rates compared with those of much of the developed world (Penm 2004). Despite the strong growth in global EWP consumption, world market indicator prices continue to decline (figure F) through increasing global efficiency gains.

Australia’s ability to compete on world EWP markets will continue to be determined by its competitiveness. Australia is one of the highest cost producers of particleboard and MDF compared with other Pacific Rim wood based panel producers (Jaakko Pöyry Consulting 2001). In general,
higher labor costs accounted for the higher unit production costs compared with developing countries such as China. Jaakko Pöyry indicated that Australia’s overall competitive position is affected by the labor cost differentials. Nevertheless, Australia’s export profile shows an ability to compete in a wide range of world EWP markets. This is mainly because of the higher quality product that Australia manufactures, particularly MDF. China’s production costs of wood based panels are considerably lower than other Pacific Rim countries.

China’s market continues to grow

China is the world’s second largest economy and is also one of the fastest growing economies. China’s gross domestic product (GDP) was US$6702 billion in 2003. The GDP of the United States was US$10 682 billion in the same year. However, growth in China’s economy has averaged 10 per cent a year since 1990, considerably higher than the average rate of growth of both the US economy (2.8 per cent) and the world economy (3.2 per cent) (IMF 2004). World demand growth for EWPs is partly determined by income growth and China is likely to continue being a key driver of world EWP demand in the foreseeable future.

China is already a major consumer of wood based panel products. China’s apparent consumption of these products has been growing at an average rate of 7 per cent a year since 1995 and reached 28 million cubic metres in 2002. Although there has been an upward trend in apparent EWP consumption, the import share of China’s EWP consumption has fallen significantly and is around 21 per cent. Furthermore, China’s declining import dependence is reflected in its declining share of world EWP imports, which fell from 15 per cent to 9 per cent over the seven years to 2002. Since the mid-1990s, China’s mix of EWP imports has also changed. Imports of plywood, a relatively higher valued EWP, have declined in importance, whereas imports of lower valued MDF and particleboard have increased.

China’s declining import dependence is related to its strongly expanding EWP manufacturing sector. The volume of EWPs manufactured in China has grown by an average rate of 9 per cent a year between 1995 and 2002. China has been the second largest producer of wood based panel products in the world since at least the mid-1990s. Furthermore, China is now a net exporter of some EWPs. Exports of wood based panels from China grew by around 37 per cent a year after the Asian currency downturn that occurred in 1997-98. China’s exports accounted for around 4 per cent of world trade volume in 2002. Although historically a net importer of plywood, China’s plywood import dependence has been declining and it became a net exporter of plywood in 2002. In contrast, China has become more import dependent in both MDF and particleboard consumption. China is currently an export market but is potentially an export competitor in the future.
Conclusion

Plantation softwood log availability in Australia is expected to plateau soon. If softwood availability was to continue growing at historical rates of around 5 per cent a year, then current industry capacity may limit EWP output growth within several years. However, given the slower projected growth in indigenous softwood log availability of around 0.5 per cent a year, it would appear that Australia’s EWP manufacturing capacity is adequate to handle the projected increases in indigenous softwood log availability over the medium term.

Australia’s engineered wood product industries have become more export oriented because production of engineered wood products in Australia has been growing more rapidly than domestic consumption.

World markets for engineered wood products have been growing strongly and the volume of EWPs traded on world markets has grown by an average annual rate of around 7 per cent since 1995. However, world markets for engineered wood products continue to be characterised by declining prices. The challenge for Australia’s EWP manufacturers is to remain competitive as lower cost developing country exporters continue to expand production.
references


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Australian Wool Innovation Limited
Chevron Texaco
Commonwealth Secretariat, London
CSIRO (Commonwealth Scientific and Industrial Research Organisation)
Dairy Australia
Department of Agriculture, Fisheries and Forestry
Department of Foreign Affairs and Trade
Department of Health and Ageing
Department of Industry, Tourism and Resources
Department of Natural Resources and Mines, Queensland
Department of Primary Industries, Queensland
Deutsche Bank
Fisheries Research and Development Corporation
Fisheries Resources Research Fund
Food and Agriculture Organisation of the United Nations
Forest and Wood Products Research and Development Corporation
Grains Research and Development Corporation
Grape and Wine Research and Development Corporation
Horticulture Australia
Institute of National Affairs, PNG
Land and Water Australia
Meat and Livestock Australia
Ministerial Council on Energy
National Oceans Office
Natural Heritage Trust
National Landcare Program
New Zealand Ministry of Foreign Affairs and Trade
New Zealand Ministry of Prime Minister and Cabinet
Organisation for Economic Cooperation and Development
Office of Resource Development, Northern Territory
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Pratt Water
Primary Industries, Victoria
Rural Industries Research and Development Corporation
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Woolmark Company Pty Ltd